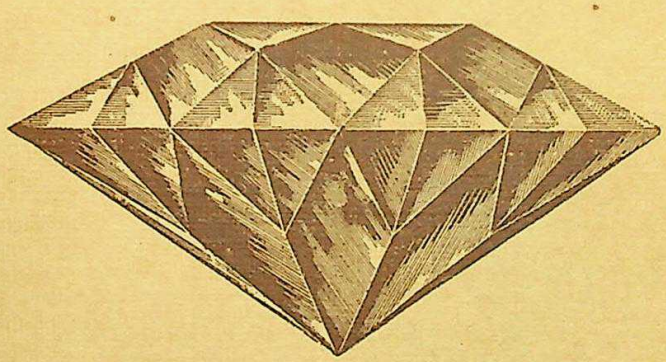
R. Howard Richards

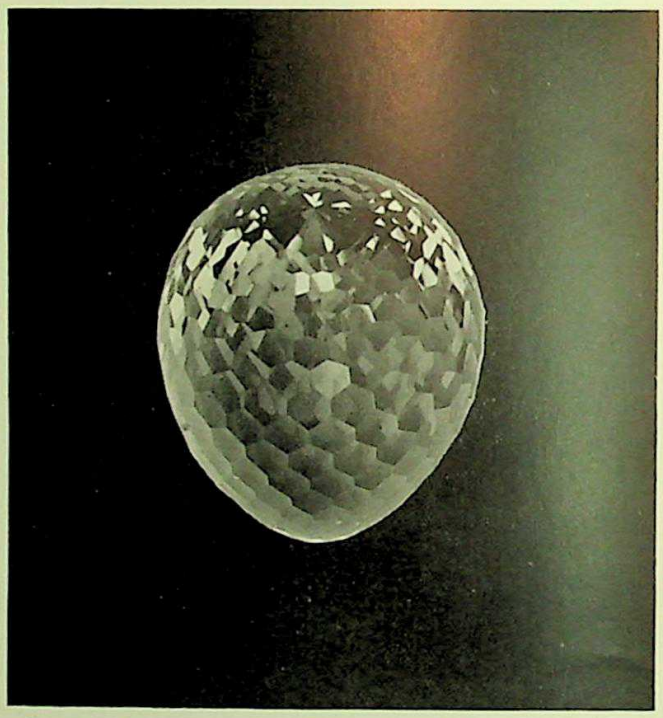
THE AMERICAN MUSEUM OF NATURAL HISTORY

THE ART OF THE LAPIDARY



By HERBERT P. WHITLOCK

GUIDE LEAFLET SERIES No. 65 DECEMBER, 1926



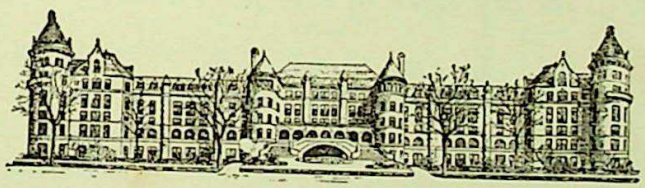
With its 444 perfectly proportioned facets this blue Topaz is a marvelous expression of the art of the lapidary. (Case VI)

THE ART OF THE LAPIDARY

BY

HERBERT P. WHITLOCK

Curator of Mineralogy



GUIDE LEAFLET NO. 65

THE AMERICAN MUSEUM OF NATURAL HISTORY

NEW YORK, DECEMBER, 1926

"And they were stronger hands than mine
That digged the Ruby from the earth
More cunning brains that made it worth
The large desire of a King."

—*Rudyard Kipling*

The Art of the Lapidary

INTRODUCTION

Although a gem mineral in the rough always exhibits certain qualities, which, to a discerning eye, give promise of its possibilities as a gem, it is through the shaping and facetting of these bits of mineral that their real charm is developed. Gem stones are, in general, cut

1.—To bring out beauties of color.

2.—To adapt them to jewelry forms.

3.—To develop the scintillating reflections from the interior of the stone by making use of the principles of refraction of light.

The first two of these considerations are too obvious to require more than a word of explanation. The surface of a transparent uncut gem stone may be compared to the surface of a body of water rendered rough and broken by waves and ripples. It is only when such a surface has been rendered smooth that we are enabled to look down into the depths below and see to best advantage its color. The stones which embellish a piece of jewelry must have a regularity of outline and a symmetry in the disposal of their planes and angles in order to best please the eye.

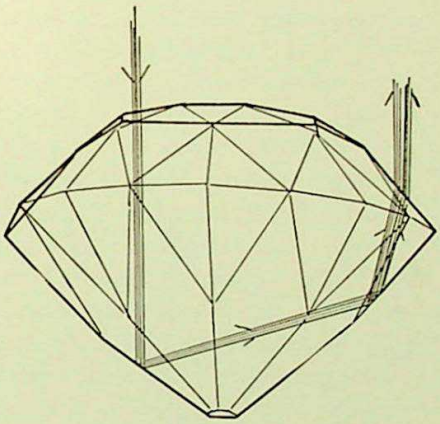


Figure 1

The third reason for the cutting of planes or facets on transparent gem stones needs rather more explanation. We have no doubt many times had occasion to admire the brilliant flashes of light reflected back from the interior of a diamond without realizing how this effect was produced, indeed the reason why a diamond glistens is to most of us a deep mystery. When we put a spoon in a glass of water and hold it above the level of the eye we can see a reflection of the submerged part of the spoon from the under side of the surface of the water which acts as a mirror. Now the light that falls on the upper surface of a correctly cut diamond is reflected back to the eye from the smooth *under* surfaces of the stone in just the same way that the spoon is reflected from the surface of the water in the glass. In figure 1 the paths traversed by some of these rays of light are shown, and it will be seen that they are reflected from the angular sides of the diamond in much the same way that a billiard ball is deflected from

the cushions of a billard table. It is important that the facets should have the correct inclination to one another in order that no light should "leak out" from the under side of the stone, and it is here that the lapidary, that is the person who cuts the stone, must take into account its *index of refraction*. By this we mean the amount of bending that light undergoes when it enters obliquely one substance such as water or diamond from another such as air. Because the refraction of diamond is so high, light having passed through it, must "hit" a surface from the inside much more squarely than would be the case with another substance, such as glass, in order to pass back into air. To insure that all the light that falls on the upper surface of a cut diamond shall be reflectedback we have only to proportion the stone so that the facets of the under side will have

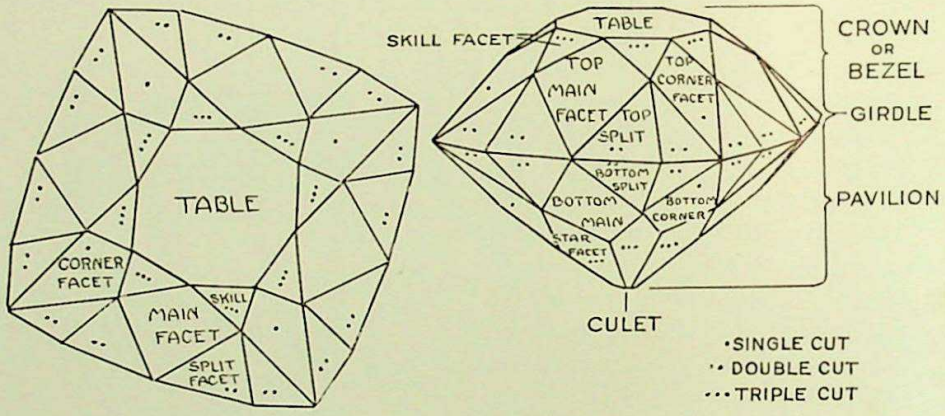


Figure 2

the proper inclination and our diamond will glisten like a star. But a diamond does something more to light than merely reflect it back, it also tends to split up the white light into the colors of the spectrum, so that mixed with the brilliant flashes of white light we also have gleams of the all colors of the rainbow sent back to the eye from our cut stone, which is very properly called a brilliant.

The upper part of a brilliant is called the *crown* or *bezel* and the lower part is known as the *pavilion*, the line separating the crown from the pavilion and which marks the widest part of the stone is the *girdle*. The size of the girdle constitutes the *spread* of the stone and the crown and pavilion taken together constitute its *depth*. There are also special names given to the various kinds of facets and these are given in diagram in Figure 2.

HOW GEMS ARE CUT

When we come to consider the methods and tools of gem cutting, we encounter a sharply defined boundry between these methods and tools as applied to the cutting of diamonds and those used in the fashioning of other and softer gems. This difference of treatment is, imposed in the case of diamond by the special difficulty to be met in grinding and polishing facets on such an exceedingly hard substance.

We will then begin our little excursion into the side of gem knowledge that deals with the way gem stones are treated at the hands of the lapidary by following a diamond on its journey from the mine to the jeweler and seeing for ourselves just what happens to it. When the diamonds are taken out of the mine, not by any means all of them are clear and colorless, as self respecting diamonds should be; indeed only about 25 per cent of the stones found are without some faint color. Of the remainder about one third are of a light shade of violet, yellow or brown, and are known as "off color" stones. The remainder roughly one half of the total find, are more or less deeply colored and are consequently of no value for jewelry although still usable as diamond dust for cutting and polishing and also for the cutting edges or facings for rock drills. So we find that at the beginning of its travels the diamond is introduced to the sorter. The sorter is a kind of a super-expert on diamonds whose eye has been trained through years of practice to detect the slightest variations in the color of diamonds, and to find flaws in stones with an ease which is little less than uncanny. Safeguarded behind a heavy metal screen, the diamond appraiser sits with a pile of rough stones before him, judging each stone and assigning it to its proper heap.

The first consideration in sorting diamonds is the adaptability of the stone for cutting. Let us assume that the stone whose travels we are following is sorted into the grade known as "close goods" comprising, complete, flawless crystals from which fair-sized brilliants can be cut, to use the trade term, "made." These usually have eight sides or faces, triangular in shape. Next comes a resorting of the "close goods" into eight grades, ranging from blue-white, which comprises the stones of finest quality, to yellow and brown crystals, which are so badly off-color as to be unfit for gems. If our stone has passed the critical test of the sorter and has been placed in one of the higher grades, it is weighed wrapped up in a parcel with others of its kind, a price per carat is assigned to it, and it is sold to a diamond dealer, and ultimately finds its way to the workshop of the diamond polisher. Here at the hands of a highly skilled workman, it is destined to be turned into a gem fit to grace beauty or proclaim opulence.

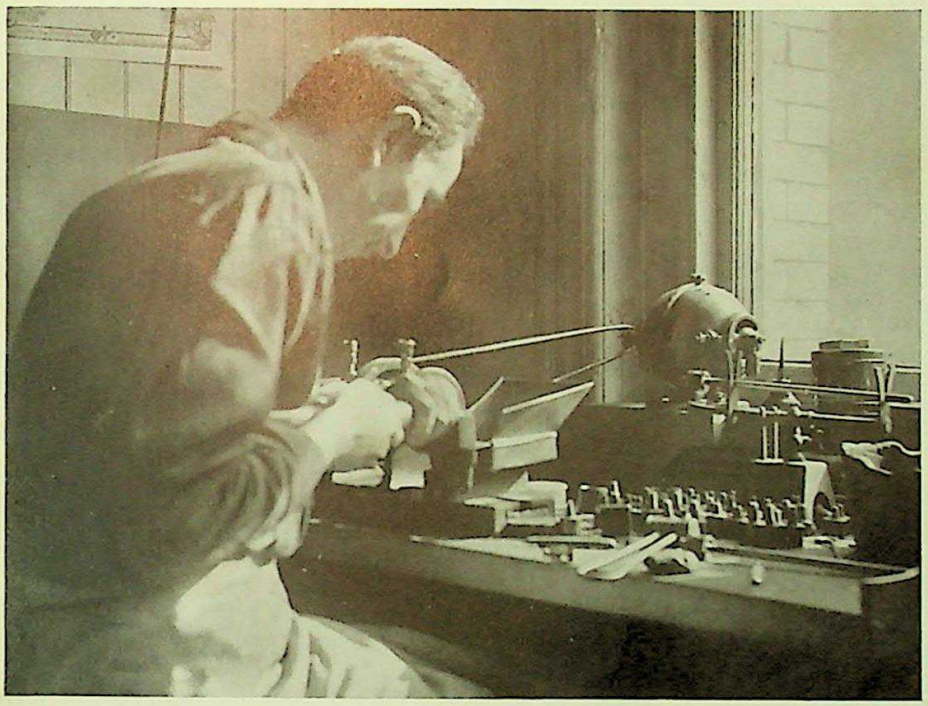
Much of this work is done in Holland and especially in Amsterdam which since the Fifteenth Century has been famous for this industry, which is in reality an art, but there are, nevertheless, a number of shops in operation in New York and in other American Cities. Like many other operators who depend for their success on a high degree of manual skill, the diamond cutter uses few tools, and these are relatively primitive and have changed but little since the days of Louis de Bequem, who cut

Like a skilled surgeon the diamond lapidary performs the delicate operation which is known as "slitting." Just the right amount of the stone, no more and no less, must be split away. The intent expression on the face of the operator bears witness to the momentous effect of the slight blow he is about to strike on the steel knife edge which he holds in his left hand.

diamonds as early as 1475. The lapidary trained in his art depends, like the violin player on the delicacy of his touch, and like the painter on the accuracy of his eye. In general he does not employ complex mechanical devices to aid him in his difficult task.

The surface irregularities, which are often present on diamonds of even the highest quality must be first split away from the stone, which breaks naturally along smooth, even surfaces parallel to the natural faces of an octahedron. Superficial flaws, that is incipient cracks, and

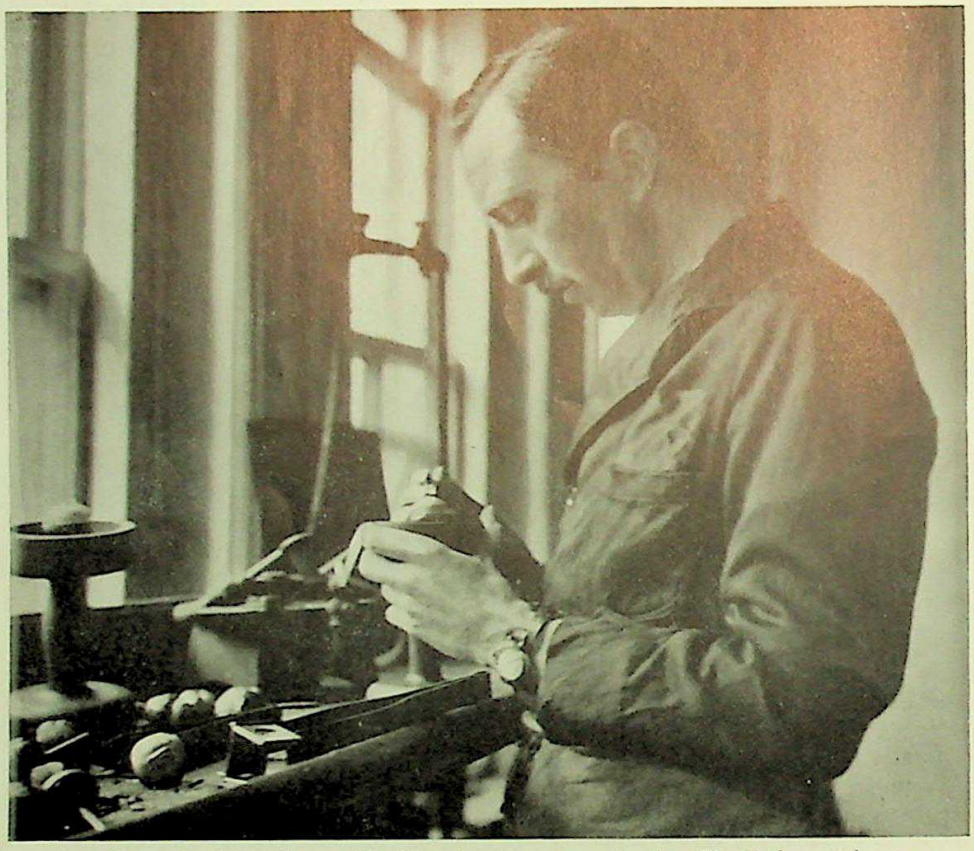
dark patches or "carbons" must also be eliminated in this way. Sometimes these occur deep in the center of an otherwise perfect crystal, in which case the diamond is divided *through* the imperfection and made into two or more cut stones. To accomplish this cleavage, which is known as "slitting," our diamond is firmly cemented to the end of a wooden stick which, in turn, is supported firmly in an upright position by wedging it



Even the refuse from this operation is valuable and must be saved. As the lapidary rough-shapes his diamonds, rubbing or "bruting" the one on the end of the long stick which he holds under his right arm, against the other on the rapidly turning spindle which is driven by the belt, the dust and fine fragments fall into the little box shown in the centre of the picture. Only the protruding end of the stick is visible in the illustration.

into a hole in the working bench. The diamond lapidary now makes a deep scratch in just the right place upon the surface of the diamond crystal, using for this purpose the sharp corner of a diamond fragment. A knife edge is then held in the correct position on the scratch, and a sharp blow with a light tool struck on the back of the knife edge suffices to remove the undesirable flake, leaving the surface bright and very smooth.

Sometimes, when the stone is large, it is of advantage to saw it into two or more pieces so as to save as much as possible of the weight in cut diamonds. This is accomplished with a thin disk of bronze, about four inches in diameter, revolving very rapidly and having its edge charged with diamond dust at the beginning of the sawing. As the saw bites into

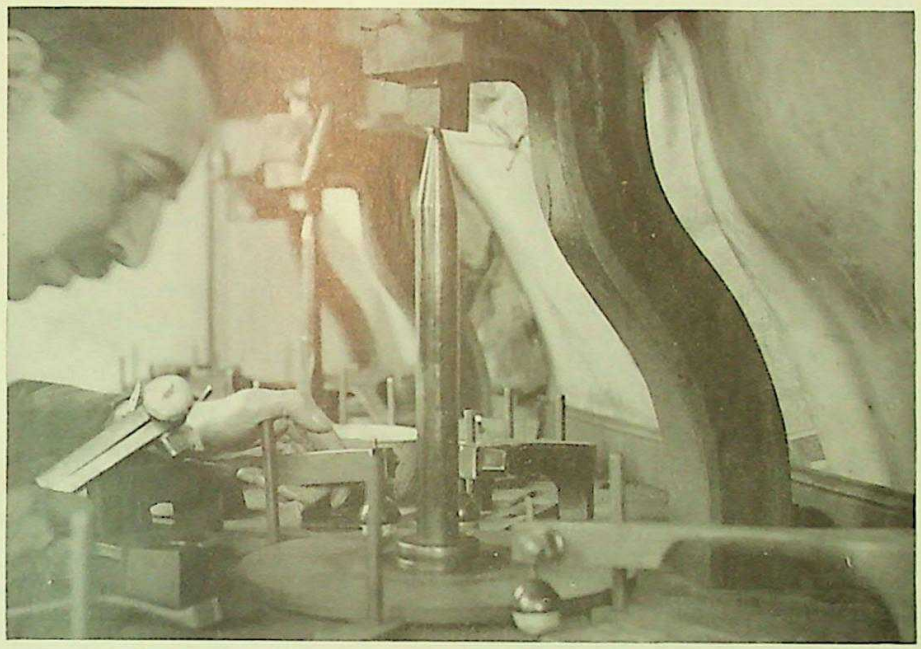


The tools of the diamond lapidary's art are very simple. The little metal cut or "dop," in which the diamond is being placed, as well as the wooden holder which carries it, are of exactly the same shape as those used by the diamond cutters of a hundred years ago.

the stone, it keeps recharging itself with the diamond sawdust. It takes many hours for this little "buzz saw" to eat its way through half an inch of diamond, but the finished product is so valuable that a day or so of labor makes little impression on the cost sheet.

The rough shaping of the diamond is done through an operation called "bruting," which consists of wearing away the corners by rubbing

one stone against another. Formerly this was strictly a manual process, the two diamonds being mounted on sticks held in either hand by the lapidary. Even into the ancient and conservative art of diamond cutting, however, some mechanical improvements have made their way, and now in most of the shops a rapidly twirling spindle takes the place of one of the hand sticks. The remaining stick has grown in length to suit the modern method. It is now about two feet long and can be firmly grasped



The actual cutting of the facets on the diamond, known as "polishing," calls for the highest expression of the diamond lapidary's art. The stems of the "dops," which bear the diamonds, must be adjusted in the "tongs" with fine nicety. Here again the form of the tools has not changed in a century. The iron "tongs," the wheel and its spindle (shown in the centre of this picture), even the metal pegs against which the tongs are kept in place on the wheel, are the same as those used in Amsterdam and Antwerp in 1821.

with both hands and held in a rest so that the diamond it bears at its end can be rubbed against its fellow, which is spinning in front of it.

Having in this manner rough-shaped our diamond, we now come to the finishing operation, the producing of the facets which give brilliancy and sparkle to it, an operation which is technically known as polishing. The holder of the stone during the polishing consists of a small metal cup on a long stem, which is called a "dop" and much resembles a tulip,

which famous Dutch flower may have suggested its shape. A solder composed of one part tin and three parts lead is placed in the dop and heated until soft. The diamond is then embedded in the solder with the portion of the stone on which the desired facets are to be cut placed uppermost. When the diamond has been properly adjusted in the dop, it is plunged in cold water to cool and harden the solder. Such drastic treatment would cause less aristocratic stones promptly to fly to pieces, but not so with the diamond; the high heat conductively of this remarkable mineral permits to to submit to the sudden change of temperature without there resulting in it even the slightest flaw.

The dop is now fastened by means of its stem in a heavy iron arm, called the tongs, in such a way as to bring the position of the facet to be cut exactly undermost when it is placed in contact with the polishing wheel or "skeep." It is here that the skill and training of the diamond cutter is exercised to its fullest, for the tilt or inclination of the various facets, the one to the other depends on the position of the dop in the tongs and on just how much the stem of the former is bent to the one side or to the other.

The "skeep" is made of soft iron and turns horizontally at the rate of about 2500 revolutions a minute. Diamond dust, mixed with olive oil, is fed to this wheel and the diamond is held in contact with it by the weight of the tongs aided by slabs of lead placed upon the latter. Much care has to be taken to keep the skeep perfectly balanced so that it will revolve without the slightest rocking motion, because this would materially interfere with the even smoothness necessary to the production of a finely polished surface. Several hours are required to cut one facet, then the dop is readjusted for another one, or the stone is removed and reset in the dop, and so on until all of the fifty-eight little faces in which lie the secret of the brilliancy of the jewel are produced.

To appreciate the exquisite skill and infinite patience involved in this apparently simple process we have only to look at the gem on our finger sending forth its magical fires, and to note the symmetry and regularity of shape of each of its tiny glittering sides. And when we remember that to produce these rainbow-like rays each must have exactly the right tilt with respect to its neighbors, we realize that a cut diamond is not only a wonderful product of nature but a marvelous work of art.

The cutting of the softer gem stones is not nearly so laborious an undertaking as the cutting of diamonds. Not only is diamond harder than any other substance known, but it is very much harder than the corundum gem stones that follow next after it in hardness. So it is that we find the tools and methods applied to the softer gem stones at once simpler and more highly manual.

The native lapidaries of India and Ceylon have reduced the apparatus of this phase of gem cutting to its lowest terms. Such a native artisan seated on his carpet in the bazaar, turns the stone lap in front of him by the primative means of a bow, the string of which is wrapped around the axis of his stone grinding wheel. By his side is a bowl containing the emery he uses as a grinding medium mixed to the right consistancy with water, and his left hand is the only holder for the gem stone that he is manipulating. This is indeed reducing the tools of gem cutting to an absolute minimum, and emphasizing in a striking way the essentials of this art.

These essentials are then:—

1.—A rapidly revolving wheel, the flat surface of which is of just the proper roughness for retaining the powdered abrasive with which the cutting of the smooth facets of a gem stone is accomplished. This wheel is usually termed a lap.

2.—A holder, corresponding to the dop used in diamond polishing, but in this instance made of wood and resembling in size and shape an old-fashioned pen holder.

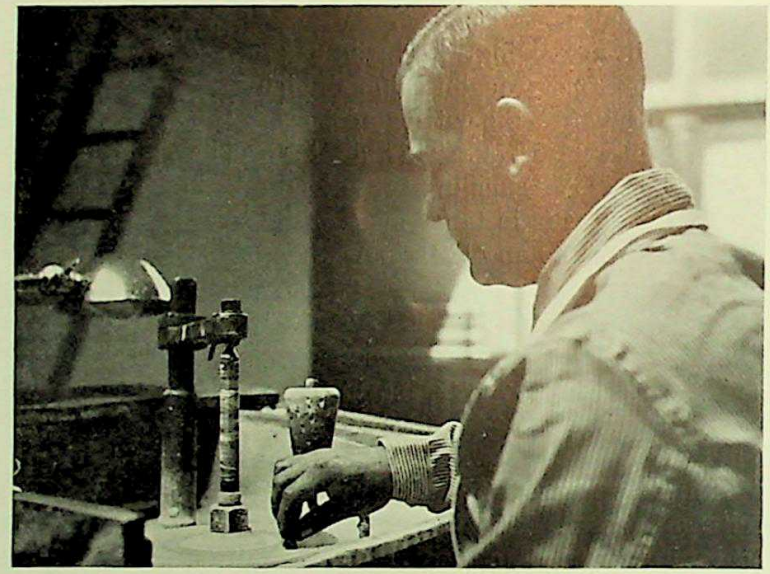
3.—An abrasive substance of a greater degree of hardness than the gem stone to be cut which is fed to the lap as a powder mixed with water to a more or less thin paste. For the final polishing the abrasive is fed dry to a wooden or cloth covered lap.

Gem stones are first sawed or "slit" by means of a thin disk of relatively soft metal whose edge is slightly indented with a knife blade for its entire circumference. Diamond dust mixed to a paste with water, is fed to this circular saw, and lodging in the indentations of the circumference constitutes the cutting edge. The process of slitting for colored stones is very much more rapidly accomplished than the corresponding operation for diamonds and, except in the case of valuable gem stones such as rubies and sapphires, no great amount of care is taken to conserve the chips taken off.

After a suitable piece, free from flaws and other blemishes, and of convenient proportions, has been sawed from the crystal or rough fragment of gem material, this piece is usually cemented to the end of a wooden holder for the rough shaping which corresponds to the "blocking out" of a painting. This is done against an emery or carborundum wheel, resembling a small grindstone and revolving on a horizontal axis. If the stone is to be given a "cabochon" or rounded cutting like an opal or a cat's eye, it is finished on this wheel and polished on a similar one of softer material charged with rouge or putty powder. If, however, the stone is to be facetted, the real skill and judgment of the lapidary is

called into play. The rough shaped stone is attached with cement to the blunt end of a wooden holder, called the stick, which is about 8 or 10 inches long and which is pointed at its free end. The position of the stone when fastened to the stick is so chosen that the table facet when cut will be at right angles to the latter and it is embedded in the cement up to the point where the prospective girdle will encircle it.

The grinding lap, which is made of gun metal, copper or lead, depending on the hardness of the stone to be facetted, is mounted so as to revolve in a horizontal plane like the skeep used in polishing diamonds,



Extremely simple are the tools and methods employed by the lapidary working in stones other than diamonds. The wheel or lap, a stick to hold the gem, a notched peg, seen behind his hand and his own supreme manual skill alone suffice him.

and the speed at which its surface travels *against* the stone can be manipulated with great nicety by moving the latter nearer to or farther from the center. Having charged his lap with the appropriate abrasive, emery or corborundum the lapidary now places the stone upon its surface and holding the stick in a vertical position grinds the table facet to its correct proportion with respect to the design of facets which he has in mind.

The next step is to cut the first of the main facets of the crown, which of course necessitates the holding of the stick at just the right angle to the surface of the wheel, and as a rough guide the lapidary is here aided by a device called the "jamb peg" mounted at the side of the lap and pivoted

so as to swing out over it. The jamb peg is shaped somewhat like an elongated peg top and is furnished with a series of shallow indentations at regular intervals from top to bottom, so that by placing the sharpened end of the stick in one of these a constant angle between the stick and the surface of the lap can be maintained. Having cut the first of the main facets of the crown to the right depth, the lapidary now turns the stick through just the right arc of a circle to bring the next facet to bear on the surface of the lap and using the same hole in the jamb peg cuts this also to the correct depth constantly inspecting his work and judging the fine points of inclination and proportion of the facets by eye. But since he can not see what is taking place while the stone is in contact with the lap, he must here depend on a highly developed sense of touch. Just as the finger of a violinist flies unerringly to the precise spot on the neck of his instrument to produce a given note, so the trained touch of the lapidary guiding the stick that holds his gem upon the wheel finds almost by instinct the correct angle for the stone to come in contact with the grinding surface to produce the result he desires.

One after the other the main, split and skill facets are cut and then the stone goes to the polisher who, working in the same way but on a lap having a softer and finer surface, and using a finer abrasive, removes the slight scratches from the facets, polishes them to a finished brilliancy and incidentally corrects any slight irregularity in their proportion. Because of this last consideration it follows that the polisher must be a master in his craft.

The crown or upper half of the stone having thus been completed it is now removed from the stick, cleaned and again mounted in cement, but this time with the lower half exposed on the end of the stick. The process of cutting and polishing is now repeated for the pavilion facets and the stone is finished.

THE FORMS IN WHICH GEMS ARE CUT

THE EVOLUTION OF THE BRILLIANT CUT

The history of gem cutting, insofar as it touches the modern art of the lapidary, may be said to begin with the introduction of diamonds as personal ornaments into Europe about the 15th century. It is perfectly true that precious stones were worn upon the person of men and women at a period which carries us well back into prehistoric times, and it is possible to trace a certain rough fashioning in even the most antique of these. But, aside from the question of whether the early gem artifacts were worn for purely esthetic reasons; or, as is more probable, for charms endowed with a certain occult potency, the fact remains that up to a comparatively late period no attempt was made in shaping a gem to do more than adapt its outline to the form of setting designed for it, and to round off its corners and irregularities so that its color might be seen to the best advantage.

In tracing the development of gem cutting in general, we are led inevitably for a point of departure to the forms first produced in the cutting of diamonds, because these early diamond cuttings impressed their character and symmetry not only upon later developed forms of cutting adapted to diamonds but to the subsequent development of forms of cutting among all the other transparent gem stones.

We have the authority of O. M. Dalton in the Catalogue of Finger Ring in the British Museum for the statement that previous to Louis de Bequem, that is prior to the latter half of the 15th century, four of the eight faces of octahedral diamond crystals were sometimes polished and the stone set with the polished pyramid projecting while the unpolished portion of the stone was imbedded in the setting. The next step in advance of this very obvious and primitive facetting was to brut two diamond crystals together until the operator had worn away one of the points of the octahedron into a square facet, corresponding to a table in the modern brilliant, and similarly worn a smaller facet on the opposite point corresponding to the culet. This earliest of diamond cutting is shown in Figure 3. Frequently the culet was omitted and the table was developed to even a smaller extent than shown. We have reason to believe that this modified point cut persisted at least into the 17th century inasmuch as a ring dating from this period in the British Museum collection is set with a diamond cut in this way.

Aside from the fact that the modified point cutting utilized the maximum spread and a large proportion of the maximum weight of a given stone, the square girdle produced a certain awkwardness which, sub-

sequently led to the modifying of this form by the cutting away of the corner edges both in the crown and the pavilion and the production of an octagonal girdle.

As a finished expression of the diamond cutters art this form of cutting, which is shown in Fig. 4, and which is sometimes called single-

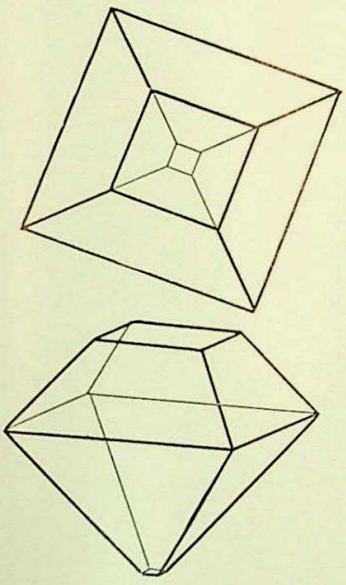


Figure 3

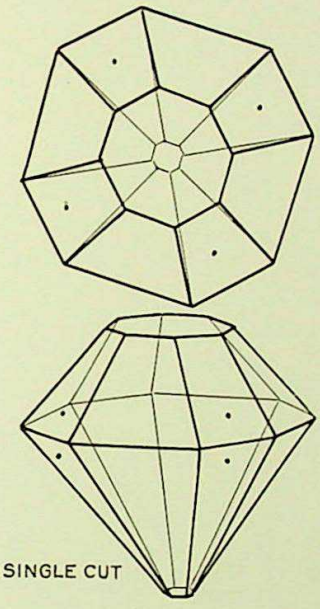


Figure 4

cut, has long been obsolete; it is, however, interesting to note that in the evolution of a modern brilliant cut, the diamond crystal or cleaved piece passes through both of the preceding forms as its initial stages before the split, star and skill facets are produced. It would seem fair then to consider both of these cuttings as old forms of brilliant cut.[1]

About the middle of the 17th century a development of the two previous forms of cutting into what has been variously called the square cut brilliants, single-cut brilliants,[2] or double cut brilliants,[3] took place. The first of these forms, Fig. 5 which we will call the square cut brilliant, retains the original square table of Fig. 3; the top main facet of a single cut starting from the corner of the table making with the single cut an octagonal girdle the corners of which are taken off with the corner facets of a double cut starting from the same point. The main and corner facets are repeated in the pavilion starting from a point on the edge

[1]See W. R. Catelle, The Diamond, Plate V, Figs. 1 and 2.
[2]Emanuel.
[3]Bauer.

corresponding to the corner of the table. This gives a brilliant of 34 facets not without a certain amount of symmetry, particularly in the crown.

The English square-cut brilliant, or old English star-cut brilliant, Fig. 6, is derived as in Fig. 4, and with double cut corner facets developed as in the previous cutting. This gives a brilliant of 30 facets with an octagonal table and a rather more symmetrical grouping of the facets of the crown than any of the preceding cuttings. A somewhat later development of the double cut brilliant is shown in Fig. 7. This is the connecting link between the single cut brilliant of Fig. 4 and the various forms of the triple cut brilliant which will be presently discussed; the edges between the main facets of the single cut being partly replaced in crown and pavilion each by two corner facets. This gives a brilliant of 50 facets with much the same outline of the girdle as has the Brazilian cut or Old Mine cut (Fig. 9).

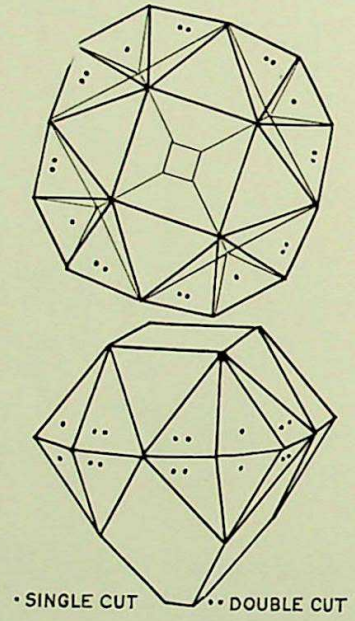


Figure 5

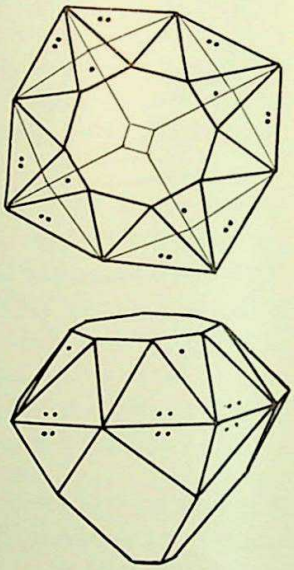


Figure 6

What the square-cut brilliants following the lines of the basic octahedron failed to do was accomplished with the introduction of the triple-cut brilliant toward the end of the 17th century and the beginning of cutting for brilliancy and weight rather than for weight alone. Three variations of the triple cut brilliant are of sufficient importance to be here considered.

The English Round Cut Brilliant of which an excellent description with relative proportions is to be found in Emanuel's Diamonds and Precious Stones, was apparently in vogue in England in the middle of the 19th century. This variation of the triple cut brilliant (Fig. 8) differs from the American brilliant of today only in the relative proportions of its essential parts. In it the angles of the octahedron were deviated from to produce a stone of depth rather than spread, the "lumpy" aspect of the cutting being the result of making the diameter of the girdle equal the

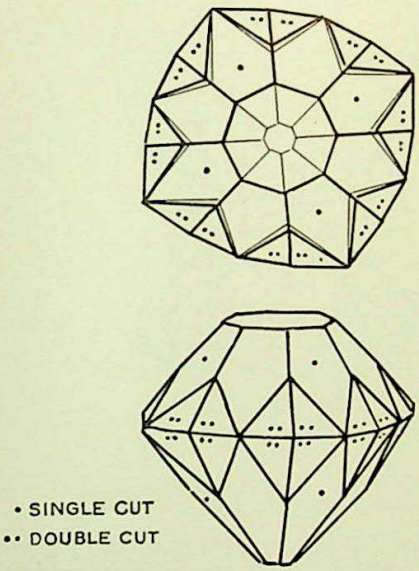


Figure 7

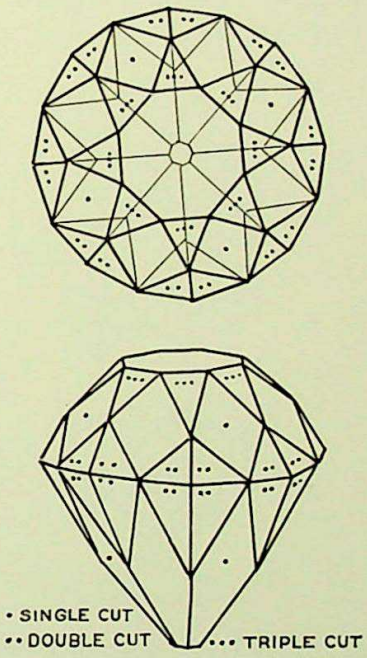


Figure 8

total depth. The number of facets were increased to 58 by the addition of the skill facets in the crown, a change which not only added to the symmetry of the exposed portion of the cutting but increased the surface reflections. The essential innovation, however, lay in the altering of the angles of the crown and pavilion main facets to totally reflect back a large proportion of the light falling directly on the crown, these reflections materially adding to the brilliancy of the cutting. It is evident that the theory of this cutting necessitates rather a high crown with a relatively small table and that some sacrifice is made of the spread of the stone so that for a given weight a stone of relatively small spread but considerable brilliancy is obtained.

The tendency to retain the girdle outline of the old square cut brilliants found expression in the Brazilian cut brilliant or Old Mine cut, which is shown in Fig. 9, and which was very much in vogue during the last century at a period when Brazil was producing most of the world's diamonds. In the example shown, the angles between the main facets of the crown and pavilion approach more nearly in average to the ideal angle (80°-85°) of the modern brilliant than in the English round cut brilliant, where this angle is over rather than under 90°. The result is a

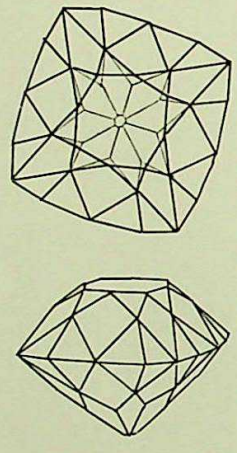


Figure 9

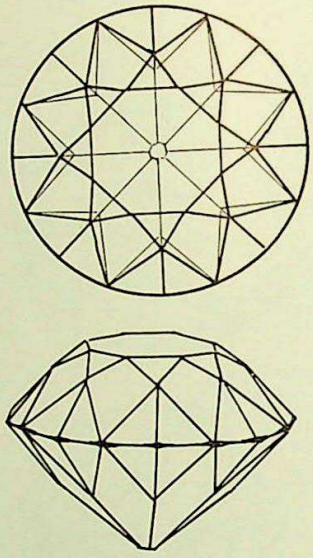


Figure 10

cutting of better because less "lumpy" proportions and one in which thinner stones could be cut to better advantage.

The final stage in the evolution of an ideal brilliant cut takes the form of the American cut brilliant shown in Fig. 10. This cutting combines the most satisfactory angles of the Old Mine cut in a brilliant with a round girdle, and although, undoubtedly some of the weight of the uncut stone is sacrificed to brilliancy and prismatic reflections a considerable spread compared with the weight of the cut stone is reached.

VARIATIONS OF THE BRILLIANT CUT

In tracing the evolution of the brilliant cut from its earliest and most primitive form down to the highly developed brilliant of our own day, we followed, as it were, the main line of evolution leading to the cutting most adaptable to stones of medium weight and general use. It must be

clearly borne in mind, however, that in the course of this development forms of gem cuttings have sprung from the main line of advance at many points, some of these having achieved only a transient popularity in the past, and some representing variations which are still in use for stones adapted to certain settings. To anyone familiar with the great diversity of these variants from the well known brilliant form of cutting, the futility of attempting anything in the nature of a classification will be quite patent. In some instances, as in the case of the table cut, the variation is mainly one of proportion, while in other cases the forms of cutting are combinations of brilliant and step cut. For convenience in arranging the data collected, it has been thought best to roughly divide the varia-

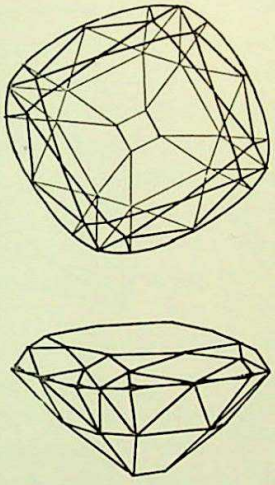


Figure 11

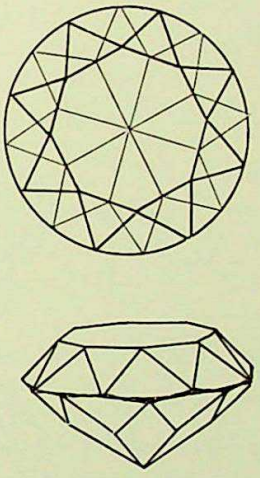


Figure 12

tions of the brilliant into three groups, based partly on the adaptability of the cutting to jewelry forms. Grouped in this way we have:

(a) Cuttings with symmetrical or rounded girdles.

(b) The commoner forms of fancy cuttings.

(c) Unusual forms of fancy cuttings.

The first of these groups include stones adapted to solitare ring settings, for the centers of clusters, and in fact for every form of jewelry setting where a round, square or six-sided stone is required.

Conspicuous among cuttings of this group is the square brilliant, a notable example of which is to be found in the Cullianan IV diamond, shown in Fig. 11. Although of much the same girdle outline as the typical Brazilian cut, exemplified in the Regent diamond, this cutting differs widely in proportion from the older forms; the crown is shallow with a broad table, and a considerable mass of the stone lies below the

girdle. The main facets of the pavilion were doubled, bringing the number of facets up to 66 and giving to the culet end of the stone the appearance of a step cut treatment.

The round double-cut brilliant shown in Fig. 12 and known as the table cut, represents a degree of simplicity of cutting which strongly suggests the old English star-cut brilliant from which it was possibly derived. The table cut has 33 facets and is characterized by a broad spread compared to the depth, and a shallow crown with a broad table. In the example studied for Fig. 12, the proportion of spread to depth was 2 to 1, and the depth of the crown was about one-third the total depth. Thin

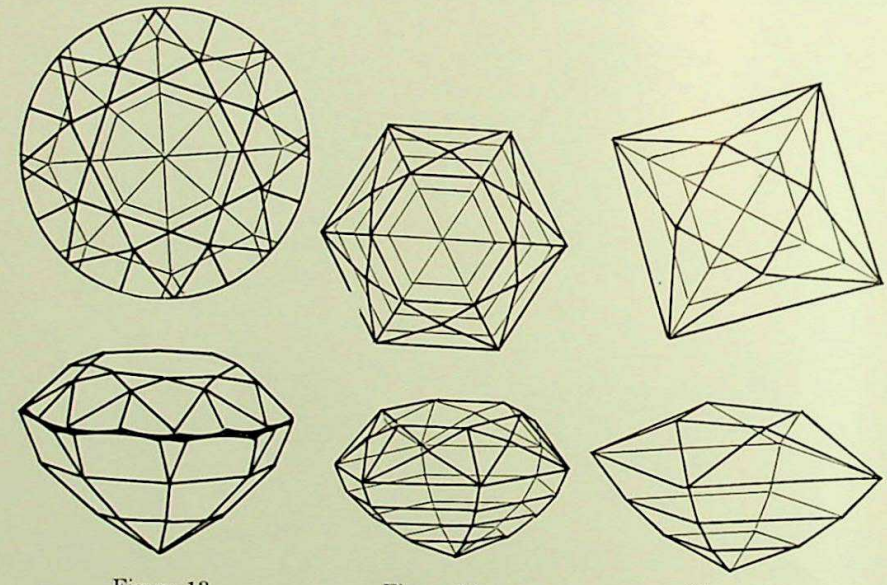


Figure 13 Figure 14 Figure 15

diamonds were formerly made in this cut, which has little or no advantage other than a high proportion of spread to weight

An extremely popular cutting for sapphires, rubies and the deeper colored semipreicous stones is the combination brilliant-step cut. An example, studied from a blue synthetic sapphire, is shown in Fig. 13. This variation of the brilliant has a rather low crown, cut with the conventional 33 facets, and a deep pavilion of three tiers of stepped facets. The girdle-bottom main facets are shaped to the circular girdle by single triangular corner facets, as shown in the figure. For colored stones of high index of refraction the combination cutting is very effective, as it brings out both the fire and the color of the gem, but like all forms involving step cutting, it requires that the proportions and slope of the pavilion facets should be carefully studied.

The six-sided cutting shown in Fig. 14 although formerly used to a limited extent for diamonds, has now almost entirely given way before the various forms of unmodified step cut. This cutting is in reality a variation of step rather than in any sense a form of brilliant cut; it is introduced here, however, because the use of corner facets in the crown allies it to an extent with the latter group. In the example shown in the figure the cutting produced rather a "lumpy" stone in which about one-third of the total depth lay above the girdle. Diamonds made in this cutting are often met with in old-fashioned settings, and there is no doubt that they possess a certain quaint charm; but unless very carefully proportioned much of the brilliancy of the stone is lost.

The French cut brilliant, illustrated in Fig. 15 is principally used for small rubies, emeralds and sapphires when it is necessary to set these in a row for a bar pin or similar piece of jewelry. In this case of "calibre" cutting the square girdles of all of the stones constituting the setting must of course be made exactly the same size. For a small circlet, as in the instance of a diamond encircled by calibre-cut sapphires, the small stones are cut with a girdle which is slightly keystone-shaped to accommodate the curve of the circle. Like the preceding this cutting is closely allied in make to the step cut, being essentially a step cut with star facets in the crown.

In dealing with the great variety of fancy cuttings which are more or less derived from the brilliant cut, the difficulties in the way of arriving at anything approaching an adequate basis of classification are appreciably more than those met with in dealing with the group of cuttings with symmetrical or round girdles. At least in these latter we were guided by the outline of the stone and by the fact that most of the cuttings of this type were designed for setting in solitaire rings or for the centers or encircling elements or clusters. We now come to a group of cuttings of excentric girdle outlines, distorted from the round and with the brilliant cut crown, which alone ties them to the basis from which they are derived, pulled this way and that until the possible shapes producible as fancy cuttings seem endless. Another point of differentiation between this and the group previously discussed, is that in the case of the fancy cuttings the stones are mostly adapted to settings other than rings, and that the cuttings are to a large extent used for the making of stones other than diamonds. A notable exception to both of these latter characterizations is that of the marquise cutting which is used principally for diamonds and is almost universally set as a ring stone. The marquise was introduced as a cutting for diamonds early in the last decade of the XIX century when popular taste in ring stones created a demand for a long narrow cutting intended to be set with the long axis parallel to the finger joints.

A typical example of a marquise cut diamond is to be found in No. VII of the Cullinan cuttings, which weighs about 9½ carats. Fig. 16 was studied from a model of this stone, and represents an average proportion between length and breadth of girdle outline which varies to a very considerable extent in this as in most of the other fancy cuttings. The 58 facets which constitute the "make" of the marquise correspond in relative position, facet for facet, with those of the round brilliant, the obvious distortion in shape of the facets being occasioned by the lengthening of one diameter of the type cutting. The broken arcs which outline the table are rendered more nearly circular by decreasing the size of the skill facets, so that instead of meeting corner to corner around the table their edges with the table are alternated with edges of the top main facets.

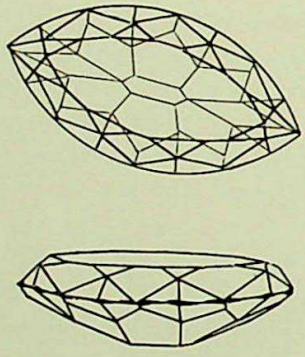


Figure 16

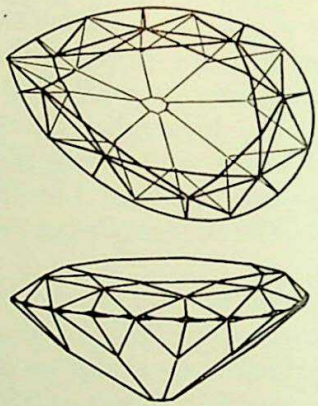


Figure 17

The pendent cut, illustrated in Fig. 17 is used for a great variety of precious and semi-precious stones. The example shown was studied from a model of the No. 111 Cullinan diamond, and may be taken as an average in proportion of length to breadth between the very broad pendent shapes, as exampled in the Cullinan I diamond and the very long slender pendents cut from small chrysoberyls, tourmalines or aquamarines. Whereas in the case of the marquise the variation from the round brilliant was produced by lengthening one diameter symmetrically, so in the pendent cut the variation consists in lengthening one end of a diameter of the type cutting. Pendent cut stones are very rarely, if ever used for ring settings, and although a considerable proportion of the stones cut in this make are diamonds, it is very generally employed for all of the light-colored stones through a very wide range of weight.

Intimately related to the pendent-shaped brilliant is the heart-shaped brilliant, illustrated in Fig. 18. This variation of the type bril-

liant cut might be considered as a pendent-shaped brilliant, with the round end somewhat flattened and with the girdle outline broadened until its length about equaled its breadth. In the present example, which was studied from a model of the No. V Cullinan diamond, the crown is shallow and the table relatively large.

No attempt has been made to work out the difficult problem of the optics of the three foregoing variations of the brilliant. There are so many elements to be considered where not even the girdle outline is a constant that we are led to suspect that the lapidaries and diamond cutters have no guiding rule, but make the stone to get the best advant-

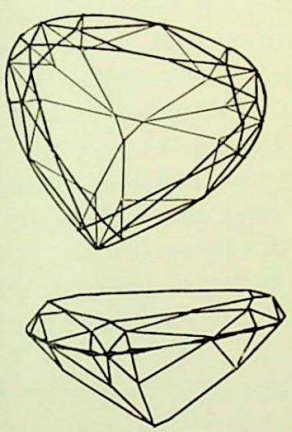


Figure 18

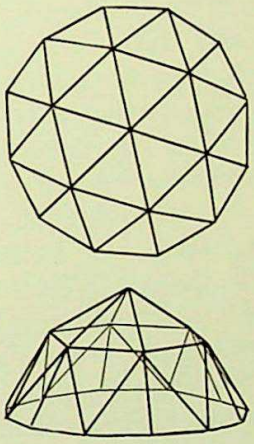


Figure 19

age of weight and spread without considering the angles which give the maximum brilliancy. The three illustrations chosen from the work of so distinguished a lapidary artist as Joseph Asscher, undoubtedly express a very close approximation to ideal proportions for their respective cuttings.

The extremely wide range of forms which are classed by lapidaries are fancy cutting precludes the discussion in a limited space of more than the essentially characteristic variations involving a treatment of the crown facets derived from the brilliant cut. With respect to the pavilion facets these "fancy shapes" have for the most part been given some variation of a step cutting, but even in this there appears to be no set rule and the details of the facetting is largely a matter of individual taste on the part of the lapidaries.

THE ROSE CUT

The "Rose" cut or "Rosette" enjoys a history more ancient, if not more honorable, than the brilliant cut. As far back as the early decades to the 16th century this form of cutting was in vogue for diamonds. It is said that several of the diamonds of the French crown were recut to a rose form by the order of Cardinal Mazarin, an association of names which had led to the tradition that the rose cut was invented by the famous ecclesiastic.

Since the 17th century the rose cut has steadily given place in popularity before the increased luster of each succeeding modification of the brilliant cut, and it is now used only for very small cluster diamonds and for such deep colored stones as Bohemian garnet.

One of the earliest variations of the rose cut is the Holland rose, Fig. 19. In its simplest and probably its oldest form this cutting consisted of only 12 facets above the flat base, arranged in two stepped rows of six each. The rose cut shown in the figure was probably derived from this, the primitive phase, by the addition of 12 facets around the base which correspond to the corner facets of a brilliant cut. The six upper facets constitute the crown and the 18 facets of the lower row are known as the cross facets. As applied to the diamond, much of the light which falls on the facets of the Holland rose in a direction normal to the base is returned to the eye above the base, but owing to the small number of reflections for each pencil of rays the rainbow-like colors which constitute the chief charm of a brilliant cut are lacking.

The Brabant rose, presents the same general arrangement of facets as the Holland rose, but differs from the latter in that the ring of cross facets is steeper and the crown lower. Optically this cutting is not nearly so efficient as the other forms of rose cut, most of the incident rays of light escaping through the base, a fact which probably accounts for its early lapse from popularity. This cutting apparently originated in Antwerp when that city was contending with Amsterdam as a diamond-cutting center and represents an unsuccessful attempt to rival a characteristic Dutch cutting.

Both of the above rose cuts have been slightly varied; as, for instance in the substitution of one instead of two facets in the double cut which takes off the corners of the base, giving to the cut 19 instead of 25 facets. Another variation carries the crown facets of the single cut to the base in a six or eight-sided pyramid, and double cuts each corner, with one facet carried half way up the edge and making the crown facets lozenge shaped. This is known as the cross rose.

The rose recoupee a more elaborate variation of the Holland rose, is shown in Fig. 20. This has twice the number of single cut facets, that is,

24; and because the single cutting is more elaborate, only one double cut facet for each corner is given. This makes a cutting of 37 facets with a 12 sided base. From the point of view of effective brilliancy, the rose recoupee far exceeds the other cuttings of this class, the leakage through the base being relatively small, and in general the light is returned through the crown facets.

The double rose, Fig. 21 is a variation hardly less classic than the Holland rose from which it was derived. It has the form of two Holland rose cuttings joined base to base, and is particularly appropriate for stones which are to be used as pendants or pendant eardrops. Set in a loop which clasps the girdle, it would seem that the brilliancy of this

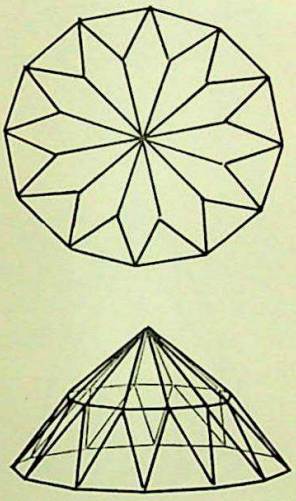


Figure 20

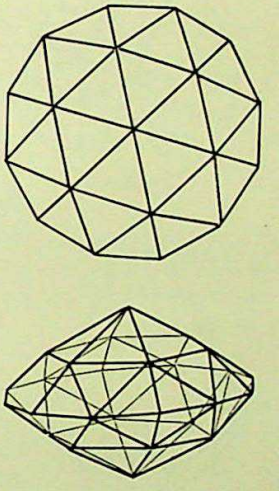


Figure 21

cutting, as applied to diamonds, has been somewhat overlooked; a study of the optics brings out the fact that it gives very effective reflections through the cross facets and that these reflected rays would, in all probability produce through their interference a desirable play of color.

So closely allied to the double rose as to almost constitute part of the same variation are the numerous forms of pendeloque cutting.[1] These may be considered as double rose cuts of which the axis of one end has been drawn out to a very steep crown, while the other end is terminated by a rose of ordinary height of crown or by one with this height slightly depressed. The pendeloque shown in Fig. 22 may be said to be formed by

[1]There appears to be a diversity of nomenclature in relation to this form of cutting, several authors mentioning it as a "briolette" or "briolette brilliant." In using the term "pendeloque" the present author follows the precedent of Dr. Max Bauer.

two cross roses and represents a rather simple cutting in this style. For pendants of the semiprecious stones pendeloque cuttings are eminently adapted and they are met with most frequently in the make of the quartz gems, rock crystal, amethyst, citrine and smoky quartz. The larger stones are given a more elaborate treatment, as in Fig. 23, which was studied from a smoky quartz pendant. Still more elaborate variations are common in the treatment of this cutting, some of them running as high as 88 or more facets. Much latitude is also permissible with regard to the proportion of length to diameter, and the shorter forms when

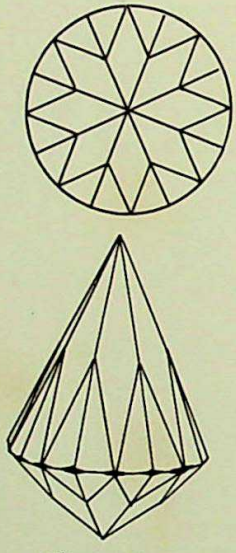


Figure 22

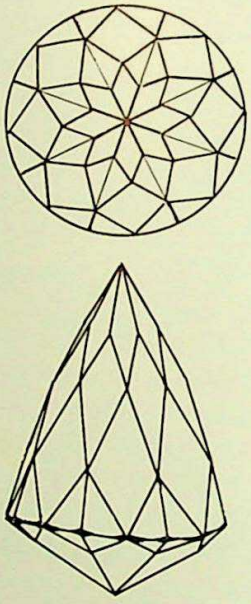


Figure 23

cut from relatively soft stones are usually bored through the axis to admit of their being strung.

From the pendeloque cutting it is but a short step to the beads and other cuttings intended to be strung. One of the most usual forms of round bead cut is the one shown in Fig. 24 which was studied from an amethyst bead of 13¼ carats. This treatment of a facetted bead may be found in almost all the materials used for this purpose, particularly in amethyst and amber. That it is a very ancient and obvious method of facetting is evidenced by the beads of the Gallo-Roman Period shown in Case XXIX of the Gem Series.

A much more unusual bead cutting is that shown in Fig. 25 and which might be termed a stepped bead. It was studied from one of a string of 29 superbly cut rock crystals and represents one from about the

middle of the string which weighed about 15 carats. Some of the larger of these beads were cut with cross facets for the two terminating rows of facets, and, in at least one instance, one end of the axis was treated as in the figure, and the other facetted for two rows as in Fig. 24.

Allied to these bead cuttings is the egg-shaped cutting given to the large blue topaz, illustrated in the frontispiece and to be found in Case VI of the Gem Series. This stone, which represents one of the finest examples of the lapidary's art, is cut with 444 facets of perfect regularity, and is so proportioned that it gives very effective brilliancy.

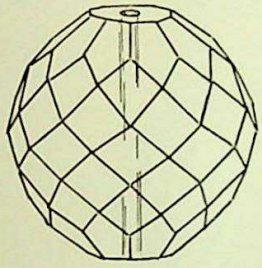


Figure 24

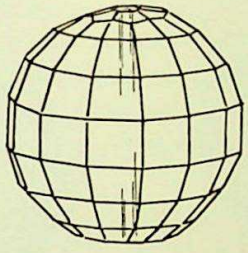


Figure 25

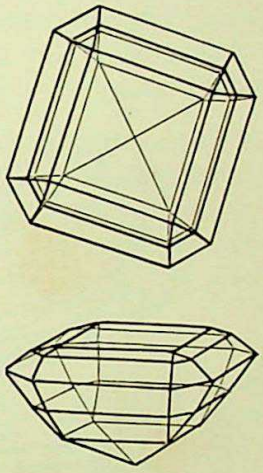


Figure 26

THE STEP CUT

When we turn back to the beginning of the art of shaping gem minerals into forms adapted to jewelry settings, we find a perfectly obvious sequence in the development of these forms. It is a sequence which, in fact, adheres closely to the lines upon which a lapidary of the present day is trained in his art. First, we have the round or oval cabochon cuttings of Celtic, Byzantine and early French jewelry, often somewhat irregular in shape, the simplest and crudest efforts in the dawning art of fashioning stones to enrich the masterpieces of the Medieval gold and silversmiths. With the development of richer design in jewelry there followed a steady progress in gem cutting, and with the call for stones of square and octagonal outline there began to be evolved cuttings with broad table facets flanked by narrow bevels to admit of the stones being gripped by the heavy settings. This early form of facetted cutting, which is essentially a primitive step cut, shows its influence in the presence of a table facet on early forms in the evolution of the brilliant cut. (See Figs. 3 and 4).

From such crude beginnings to the typical emerald cut Fig. 26 of the present day, the advance has been only along the lines of more complex and symmetrical facetting, produced with a view to making a stone of more elegance of outline, where the display of the color is the primary consideration. In this way the form of step cut shown in Fig. 26, is very widely used for emeralds and is given proportions directly dependent on the depth of color in the stone to be cut.

A fairly recent practice in diamond cutting has adapted the step cut to the making of diamond gems of especially choice quality. When applied to diamond, however, the proportions of the step cut must be carefully studied with respect to the effective rays of light which are returned through the crown facets after total reflection within the stone.

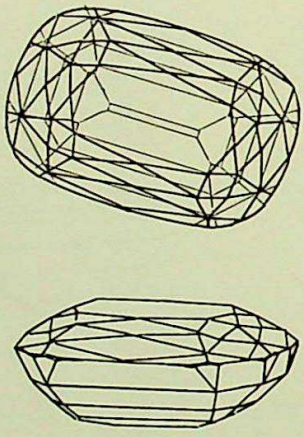


Figure 27

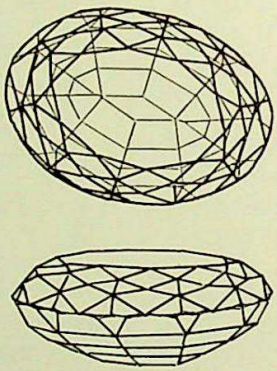


Figure 28

By far the most widely recognized derivatives from the step cut are those combination cuttings which use a brilliant or modified brilliant cut treatment for the crown facets and a stepped facetting for the pavilion end of the stone. One of these derivatives has been already discussed under variations of the brilliant cut, for the reason that it belonged more properly among the cuttings with round girdles than in the present group of cuttings, which include oval and oblong variants of the step cut, notably characterized by their complex multiplication of facets.

Cuttings of this kind are almost universally applied to large stones of the light colored gem minerals, such as amethyst, aquamarine, topaz, citrine, light colored tourmaline, peridot, smoky quartz, etc. In the example illustrated in Fig. 27, which was studied from a blueish green aquamarine of 30½ carats weight, the brilliant cut treatment of the

crown includes two rows of main facets instead of one, the large size of the stone necessitating an increase in the number of facets to give symmetry and surface brilliancy to the cutting.

Fig. 28 was also studied from an aquamarine, in this instance a stone of 13½ carats. The oval shape is produced by the use of 10 instead of eight groups of facets, and, as in the former instance, the main facets are doubled in the crown and the stepped facets of the pavilion are accommodated to the oval girdle by single corner facets. The beauty of this stone has well repaid the lapidary for the labor of cutting 122 facets which constitute its make and it may well be considered a masterpiece of well balanced and accurate gem cutting.

With larger stones the number of facets demanded by this cut may be increased almost indefinately. Leopold Claremont illustrates[1] a very large oval aquamarine which is cut with 313 facets in the crown alone. But unless well proportioned and symmetrically distributed the multiplication of facets in the combination step-brilliant cut tends only to detract the eye from the color, which constitutes the real beauty of the large semi-precious stones.

1"The Gem Cutter Craft," page 182.

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